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INSIGHT

The Corporate Refresh Cycle Grinds into Motion

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IDC OPINION

Organizations have been holding onto their existing PC clients (desktops and notebooks) longer for two reasons: money is scarce and the systems in place have been doing an adequate job. However, an institution can stretch the replacement cycle only so far before it starts to cost itself money, in both hard dollars and opportunity costs. If your organization has not upgraded its client since before the Millennium, now is the time to get started.

- Turning over clients on a regular basis is the best practice, although there are multiple opinions over the exact length of the life cycle.
- A reasonable rule of thumb is two to three years for portables and three to four years for desktops.
- Thus, every year, an organization should budget sufficient capital to replace anywhere from 25–50% of its clients, depending on the mix of form factors and the conditions in which the PCs are used.

IN THIS INSIGHT

This IDC Insight reviews the history of the PC refresh cycle, assesses its current status, and recommends that the time has come for companies to move to the next generation of technology.

SITUATION OVERVIEW

The corporate refresh cycle has been delayed for a number of reasons over the past three years. Essentially, the recession that begin at the end of 2000 has caused many CIOs and IT managers to put off renewing corporate clients (i.e., desktops and notebooks) to spare the bottom line. This strategy has been renewed quarter after quarter as CFOs reassess the bottom line and delay capital spending. Other factors have sustained this delay, including the fact that existing client computers were good enough to handle the workload of the day.

How did an industry on fire in the late 1990s slow to a crawl in 2000, dive in 2001, and now is turning in only single-digit growth? This pattern can be traced to the Millennium, a moment when virtually everyone, in both commercial and consumer segments, was convinced that they had to refresh their systems to be safe from the Millennium Bug — which turned out to be about not much at all. Nonetheless, with the huge momentum of consumer buying that accompanied the "buy a PC and get on the Internet" craze, most people and organizations entered the new century with a newish PC.

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And so the Millennium refresh — with some help from a cultural trend — ended up coordinating the buying cycle. A five-quarter wave of extraordinary buying occurred from 4Q98 to 4Q99. A quarter before the century-turn, shipment volume dropped precipitously. During the two-quarter hop from 4Q99 to 1Q00, there was a dearth of activity, a pause while everyone, safe from the bug, enjoyed their new computers, which were, for the most part, handling their workloads nicely.

Then, the recession kicked in. Capital projects were put on hold. CIOs, demoted from strategic partners to tactical management, were being asked to find savings in the enormous and heretofore growing IT budget each quarter. Because the PC clients in place were basically working, no clear reason presented itself to upgrade, even in companies that had previously followed a best practice of rotating out their clients on a regular basis. The average life of a PC drifted upward from just shy of four years to nearly five, and the pool of new users who just wanted a PC to get on the Internet began to dry up.

Each quarter since mid-2001, the CIO has been faced with the same question: Where can I get the savings to help the company make the bottom line? And each quarter, (among other things) the answer has come up the same: Eke some more life out of those clients.

At this point, however, corporate clients are getting seriously long in the tooth. Although they still do a pretty good job with the workloads of 1999, they are beginning to pant under the computing jobs of 2003. Now, and from now on, older clients will create more and more of a drag on competitiveness and profits. The time has come to upgrade.

REASONS TO UPGRADE

The main reason *not* to upgrade is that it requires a substantial capital expenditure. Another secondary reason is related to the cost of migrating corporate software images. Against these hurdles must be stacked the growing number of reasons to begin the client renewal process, some of which involve rising operating costs.

Reasons to upgrade fall into two main categories: technological and business. In the following sections, we lay out the argumentation for both.

TECHNOLOGICAL REASONS TO UPGRADE

As technological development moves forward, older clients become more of a liability in terms of potential failure, security risk, and opportunity cost.

RISE IN FAILURE RATES

One of the first and most obvious costs to holding a client too long is the rise in failure rate after the fourth year of deployment. In early life, certain failures occur that can be attributed to the shakedown period. After that, failures remain quite low for the next two to three years. However, after that, failures begin to rise again as components reach the end of their "design life" or period that the manufacturer specifies that the component is designed to last.

PUSHING THE COMPONENT DESIGN ENVELOPE

Although there are generally accepted rules of thumb for system replacement cycles, customers tend to only focus on one dimension when predicting the financial risk associated with purchasing a new system — the warranty. The warranty period is the time that a manufacturer will fully support a system without any additional customer expense (e.g., extended service plans). However, there is another important design

specification that often gets overlooked — component design life. Although most customers believe that the components that make up a PC will run "forever," the truth is that many of the electromechanical components (disk drives, floppy drives, optical drives, and fans) have a limited component design life. In the case of hard disk drives this is often specified at five years. This figure basically equates to the period of time that the manufacturer *expected* the product to be in service. Given the nature of what a hard disk drive does (primary storage), pushing beyond this design life could be tempting fate. Although the cost of replacing a hard disk is certainly not equal to that of replacing a PC, when you factor in the data migration, component, and service charges, this can run into the $350–500 range per client depending on the component being upgraded. As for the other electromechanical devices, although they may very well last longer than the component design life, when they go, what is the lost productivity cost of not having a working CD-R or DVD drive?

SECURITY HOLES IN OLDER OPERATING ENVIRONMENTS

A key fault in older OSs is that they have security holes, some of which are unpatchable, given their architecture. In today's world of ever-more-aggressive hackers, any vulnerability that can be exploited likely will be. By sticking with an outdated OS, companies increasingly put their electronic assets at risk.

DECLINING SUPPORT FOR OLDER OPERATING ENVIRONMENTS

Accelerating the obsolescence of older OSs is Microsoft's pulling of support for these now-outdated architectures. Once support is ended, the OSs will continue to operate, but any new bugs or security holes found in them will not be fixed. As a result, if a hacker finds one vulnerability after the support period ends, that OS will permanently become an open door to anyone. Typically, even the most simpleminded malefactor can just go up on the Internet and download the hack. All older systems will be open to virtually any motivated hacker.

Although Microsoft recently extended support for Windows 98 and Windows NT4 until yearend 2003, it originally announced withdrawal of such support as of June 30. Customer clamor obtained the extension, but the handwriting is on the wall: Support will be withdrawn at some point, and it is likely to be earlier rather than later.

OLDER HARDWARE NOT UP TO NEWER SOFTWARE

One possible pathway would be to run a new OS, say, Windows XP, on existing systems. Nearly two-thirds of the installed base worldwide is three or more years old. Specifically, in the commercial base, more than 200 million machines have processors running at 600MHz or slower and typical memory configurations of 64MB or less. It is possible to put more memory on these systems and attempt to run a newer environment with what amounts to a minor upgrade. However, the difference between current hardware platforms and previous ones is not confined to processor speed. All of the subsystems have been built out. System performance basically follows a chain metaphor, in which the weakest link represents the current bottleneck. As soon as that bottleneck is removed, the next-weakest link becomes apparent. For example, for certain applications, disk access speed may be the gating factor. For others, memory management may be stressed. For a host of possible reasons, newer software may not run as well on older hardware.

SECURITY OF NEWER ENVIRONMENTS

Since the consolidation of the industry around Microsoft's standards, these OSs have increasingly become the target of malicious hackers. Whether motivated by limelight, political goals, financial gain, or ideology, these ever-more-sophisticated software and communications artists represent a threat to organizational assets. In response,

Microsoft implemented continuous software maintenance with Windows XP, staying abreast of hacker developments by downloading patches to IT managers and end users as soon as possible after a new hole comes to light. This process is ongoing, a game of cat and mouse in which both sides escalate continuously — the hackers always sniffing for new holes and Microsoft and its industry partners always on the alert with teams ready to mend the hole as soon as it is discovered. Because of this feedback loop, the current systems are commercial-grade secure. At least they will not fall prey to the latest virus attack.

Additionally, newer security software and hardware (e.g., encryption algorithms and biometric readers) are designed to run in the newer environments. For those companies concerned about this level of security (a growing segment), a new OS is a must.

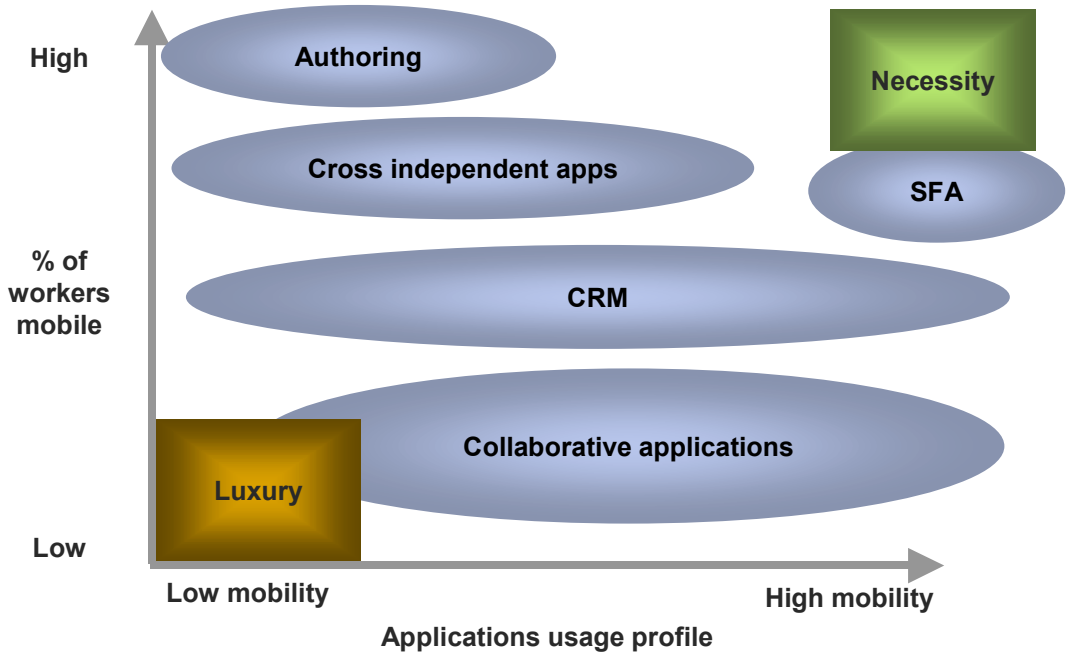
PRODUCTIVITY ENHANCEMENT THROUGH WIRELESS

For those enterprises with a substantial mobile worker population, wireless is an increasingly interesting communications technology. The benefits to productivity are clear. Even mainstream workers — let alone mobile executives — are able to spend more time working in a more broadly defined workspace. Rather than being confined to a desk, a worker can change location on a campus, have data at hand during meetings, and move from time to time to an alternative area (e.g., cafeteria, comfortable seating area, or empty conference room) to do a particular task. This mobility is further enhanced by some of the new tablet designs. To gain the benefit of wireless, organizations must move to new hardware and software platforms.

One indication of which way things are going is that a growing proportion of thin-and-light notebooks have wireless chips embedded on the motherboard, particularly since the introduction of Intel's Centrino package. Other wireless suppliers are also offering embedded solutions. We believe the move to WiFi in corporate environments will be initially an organic movement driven by leading-edge suppliers with a specific business need, such as inventory tracking. Over time, once the security and management issues of wireless technology are better addressed, we expect that enterprises will approach the decision to move to wireless (as shown in Figure 1) by plotting an application usage profile over their number of mobile workers. Looking at it from an application standpoint will give better clarity to whether the decision is a luxury or indeed a necessity. We believe over the next 12 months there will be a greater clarity for suppliers in this decision-making process. Once the need is better understood, we expect the combination of Windows XP (with better wireless support) and Centrino (a better overall mobility experience) will drive upgrades.

FIGURE 1

MOBILITY AND WIRELESS WLANS: CORPORATE NECESSITY OR LUXURY?



Source: IDC, 2003

I/O PERFORMANCE OF NEWER SYSTEMS

In a previous section, we discussed why older systems are unable to keep up with newer software requirements. In subsystems that surround and communicate with the processor, newer systems benefit from a number of developments, including USB 2.0, faster system buses, and higher-performance memory types.

USB 2.0

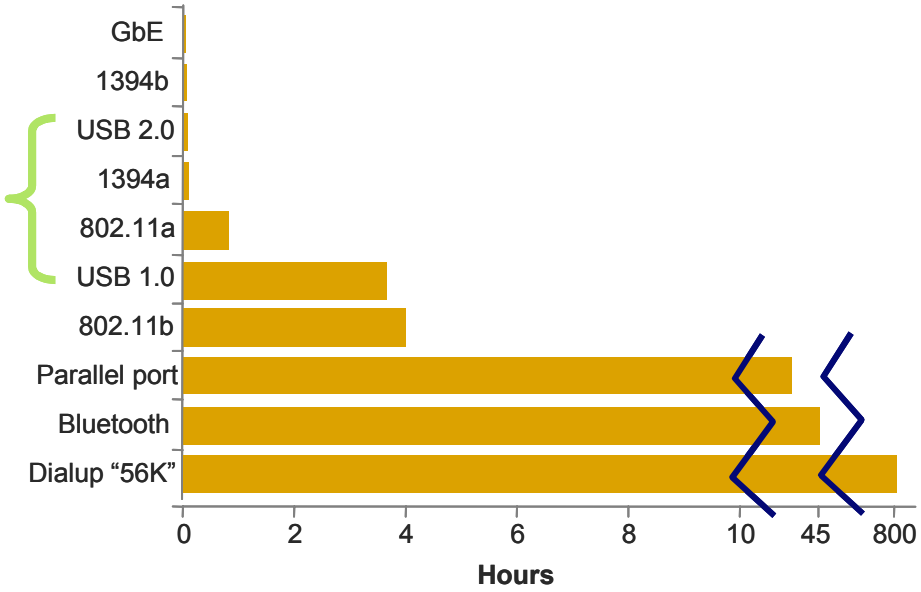
USB 1.0 was 12Mbps; USB 2.0 is now 480Mbps, a 20x throughput improvement. In real world terms, this means that if a user wants to move 2GB of data across a USB 2.0 interface it can be done in about 10 minutes. This compares with the 3.75 hours it would take with USB 1.0 (see Figure 2). The productivity gain from this kind of performance increase is significant. This increase argues strongly in favor of a new client upgrade. Also, a high-speed external interface allows far greater flexibility in client design. With high-speed external peripherals, the system chassis can be designed to be much smaller, allowing users to customize configurations on an as-needed basis without introducing performance bottlenecks. In addition, this high-speed external interface could drive client upgrades in vertical applications (such as real estate and insurance) where graphic images are moved and manipulated with greater frequency.

FASTER BUSES

Intel recently introduced an 800MHz system bus with its new 3.00GHz Pentium 4, a speed bump up from the 533MHz bus of the most recent generation, which is itself quite a ways up from the 100MHz three-year-old systems.

FIGURE 2

TRANSFER TIME REQUIRED FOR A 2GB FILE BY INTERFACE



Note: Data does not assume system overhead.

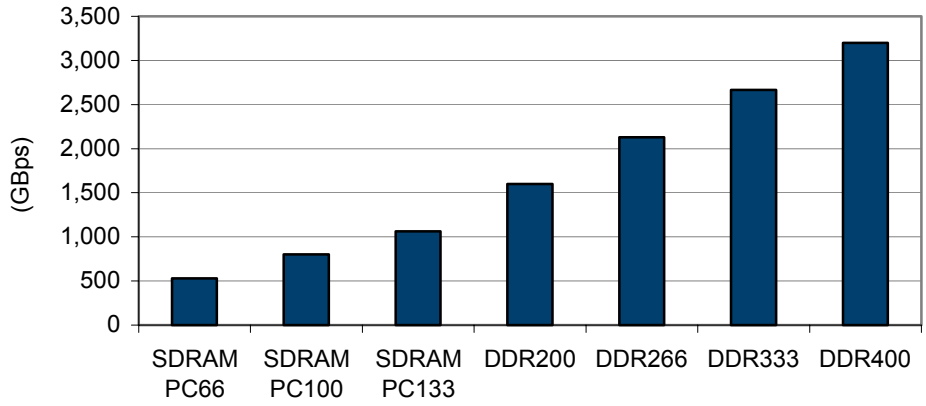
Source: IDC, 2003

HIGHER-PERFORMING MEMORY TYPES

Memory has evolved from PC66 SDRAM, which was still prevalent in 1999, to DDR 400 memory, the leading edge today. This evolution represents a sixfold increase in throughput from 528 to 3,200GBps (see Figure 3). During the same period, memory densities increased fourfold, from 75 to 325MB per system (see Figure 4).

FIGURE 3

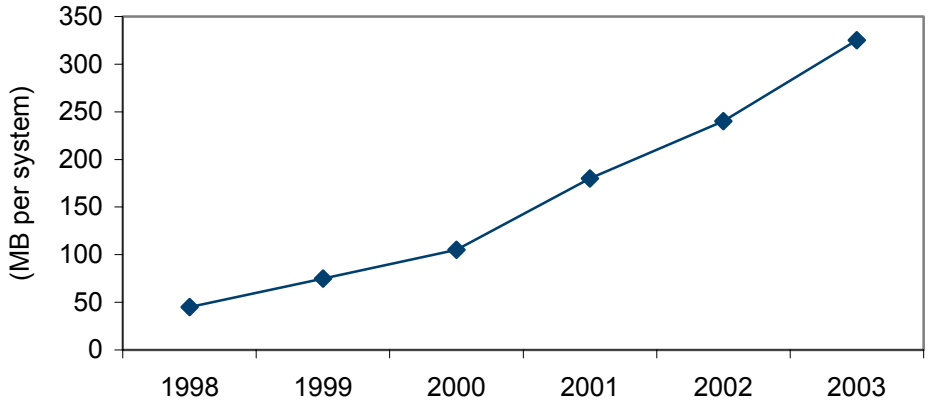
MEMORY THROUGHPUT BY TYPE



Source: IDC, 2003

FIGURE 4

SYSTEM MEMORY DENSITY, 1998–2003



Source: IDC, 2003

BUSINESS REASONS TO UPGRADE

In addition to technological reasons to upgrade, a number of business reasons also argue in favor of buying new systems.

INCREASED PRODUCTIVITY

Although productivity is more difficult to define and measure, the productivity increases gained by deploying new systems are actually quite substantial.

ESCAPING THE HOURGLASS

Perhaps the rawest and most ubiquitous measure of productivity gain from faster system performance is a reduction in the time spent waiting for processes to complete. Every time a program is opened or closed, a save operation initiated, a formatting command issued, or many other processes undertaken, the system locks the user out and displays an hourglass to indicate that he or she must wait for the process to complete to begin working again. Depending on the system and the program, these spinning-hourglass moments can last from a few seconds to more than a minute. System startup and shutdown are also time-consuming processes. Because of their frequency, these snippets of time add up to substantial numbers of hours lost during a year's time, hours that could be used for more productively if the system were lighter on its feet.

HANDLING MULTIMEDIA MORE CLEANLY

Despite the fact that older systems with enough memory and a decent graphics subsystem can often do an adequate job of multimedia processing and output, older systems are limited in what they can do in terms of quality. Although multimedia consumption is more commonly associated with home entertainment, corporations are increasingly turning to multimedia to make their point, whether it be in staff presentations or customer sales calls.

GREATER PROTECTION OF INTELLECTUAL PROPERTY

One of the most costly potential liabilities of older systems stems from the possibility that they could become a node of vulnerability in the corporate network. If a motivated hacker gets a hold of an unprotected (and perhaps unprotectable) client, he can enter the very bowels of the corporation, rooting out competitive information or trade secrets. Although the likelihood seems remote, a breach of this kind could be ruinous for a firm in a highly competitive industry. Only newer clients can be secured sufficiently to reduce this risk to a manageable level.

GREATER POSSIBILITY FOR COLLABORATION

On the plus side, newer clients allow employees who are remote from each other to work together through the use of the latest collaboration software, which allows multiple people to view, and even modify, the same file while in different places.

LOWER OWNERSHIP COSTS

Because new OSs are designed to be managed remotely and are more robust to begin with, newer clients are less expensive to maintain. By reducing the average number of service calls per installed PC, an IT department can substantially lower its client ownership costs.

IMAGE MANAGEMENT

Using the latest image management tools, an organization can reduce the cost of managing its images, potentially even reducing the number of images in a more standardized environment.

BACKGROUND COMPUTING

One way that a lot of computing cycles will get used us is via background computing, the execution of tasks that occurs while the user is engaged in some other task in the foreground. The user sees the foreground task on his or her screen, and the background tasks execute within the system, unnoticed until and unless they produce some result that the user sees. Background tasks include multitasking, encryption, compression, smart agents, client management, proactive information organization, and data mining.

MULTITASKING

Multitasking, long talked about and only recently delivered in its true form in the Windows environment with Windows 2000, is a core technology that enables background computing. In a multitasking environment, processes are independent of each other and their execution is constrained only by hardware limits, which are progressively being relieved as processors get faster, buses get wider, memory gets larger, and drive access times drop. It is multitasking that allows one or more background tasks to operate effectively in a sufficiently powerful system. Background multitasking is invisible to the user. In addition, the user may launch a number of processes in the foreground, utilizing yet more system resources. Depending on the degree, multitasking can seriously strain the capabilities of older systems.

ENCRYPTION

Encryption will be key to ecommerce as it is fully adopted by both consumers and enterprises. Strong encryption requires a fair amount of processing power, and the encoding and decoding process can potentially slow down a system to a noticeable degree. However, with enough processing power, encryption can take place in the background without disturbing the foreground task. In the future, most data will be encrypted routinely for transmission. The results of encryption activity are invisible to the user. Related to encryption is data integrity. The user needs assurance that when a file is decrypted it is exactly the same string of bits that was encoded at the other end. Data integrity is of growing importance to most enterprises, particularly given the frequency and viciousness of recent attacks on corporate networks by malicious hackers.

COMPRESSION

Compression is an artifact of the lack of bandwidth. If bandwidth (and drive space) were infinite, there would be no need for compression, but these resources are still relatively scarce. Thus, it is up to the computer to do the necessary housekeeping to make better use of available bandwidth. Compression algorithms can be fairly computation-intensive, and, as a background task, compression can operate effectively only on a system that has enough processing power to support it. The results of compression activity are invisible to the user.

SMART AGENTS

Smart agents are an idea whose time has not yet come, but which will eventually make personal computers far more useful than they are today. The concept of a smart agent is that it does a particular task (e.g., look for articles on a particular subject or locate the telephone numbers of all people in a particular category) by searching the Web intelligently in the background. When the agent completes its task, it notifies the user, who can display the results when desired.

CLIENT MANAGEMENT

Client management is becoming more and more important, particularly to large enterprises. IT departments need to be able to update software, troubleshoot hardware, and perform virus scanning and other management tasks over the corporate network. Using manageability software, IT can perform these tasks easily from a central location. With enough processing power on the client, these functions can be performed in the background without disturbing the foreground task. Client management is nearly invisible to the user, who may nonetheless see evidence of virus scanning or software updating in the form of shields or notifications.

VIRUS SCANNING

Virus scanning is a key capability in today's business world. As virus attacks evolve into ever more sophisticated assaults, large enterprises need a way to scan frequently for alien code in the background without disturbing the foreground experience. Even enterprises that have never considered other sorts of background computing are being forced to implement virus scanning aggressively.

PROACTIVE INFORMATION ORGANIZATION

Proactive information organization is an exciting new use of computing power beginning to emerge in the form of software from companies like Enfish. This software is designed to meet the growing requirement for managing the proliferation of data files occurring in most users' hard drives. By now, typical users have several gigabytes of accumulated files, and even the best planning and most robust filing systems are staggering under the weight of trying to keep all this information in some form that is accessible and easily usable by its owner. Proactive information organization makes an intelligent guess about the nature of content in a particular file and groups it with other files of a similar type, depending on a specified query. A different query might call up a totally different sort of organization. This type of application is quite computing intensive, but will become more and more common as the amount of information continues to grow and the ability to process it comes up to speed.

DATA MINING

Data mining shares some characteristics with proactive information organization and smart agents, but the data mined is typically either out on the Internet or in a large database. The concept of data mining is that large or dispersed databases have a lot of value if only someone could figure out how to find the right data elements and line them up in such a way that the relationships could be seen clearly. Data mining software is computing intensive, but there is no reason that data mining could not be done on a PC if it had sufficient processing capability. Data mining can be initiated by a query and operate quietly in the background until a result is ready.

APPLICATIONS OUT OF THE BLUE

As sure as the sun rises, unanticipated applications will emerge that will stress existing platforms. For example, a number of firms are working on techniques for video distribution for commercial applications. If these techniques become common, we can expect that many firms will recognize that even today's high-end hardware is right at the low end of what is needed to handle the task.

FUTURE OUTLOOK

Although there are many good arguments for organizations' maintaining a relatively up-to-date client pool, none of them seems to make their case with enough urgency to cause an immediate response. Yes, it is true users will be more productive with new clients, but how much more productive? And, viewed against acquisition cost, will that productivity be sufficiently offsetting? However, while there is no event that requires organizations to upgrade immediately, the cost and difficulty of doing so increases steadily over time. There is substantial evidence that something as basic as support cost begins to rise after the fourth year of a typical client's life. As another example of how waiting comes with a price tag, the cost of migrating data from older, soon-to-be-unsupported environments increases the longer an upgrade is delayed.

One of the results of this lack of a pressing reason to upgrade will be that no discernibly large wave of buying will occur during the next several quarters. Organizations will not all move at once. Each one will move when its own particular set of imperatives reaches a critical threshold. Thus, a mass of individual decisions will result in a generally raised level of buying this year and next, but not a huge spike in any particular quarter.

We expect that most organizations will reinstitute a client replacement program this year and next. The sooner the IT department gets started, the sooner its end users will be able to take advantage of the newer applications and data types, such as collaboration and video.

ESSENTIAL GUIDANCE

We believe that investing in PC components incrementally does not make sense for systems more than three years old, given all of the costs associated with new components, data migration, and client down time. For example, to upgrade an OS, disk drive, memory, and USB interface, customers can expect to spend more than $600 in component and software costs before including the cost of data migration and client downtime. For some of the key PC components, the design life is five years. Pushing the specification is akin to pushing the 10-year air bag certification in automobiles. It is the life of your data and associated productivity we are talking about. The cost of retrieving and restoring data can easily be offset by having a system with newer components. Finance departments should fund and IT managers should implement a client renewal cycle. The benefits of having up-to-date clients include Increased productivity, service cost savings, and a better end-user experience.

Given that mobile clients are becoming more cost effective and productivity enhancing, IT managers should consider replacing desktop systems with portable PCs in the next cycle.

It is considered a best practice to choose a financial or technical life span for a given class of clients (e.g., three years for desktops and two for notebooks) and implement an upgrade plan more or less continuously, swapping out 25% or 33% of the base each year. In terms of image management, this scheme requires keeping two environments going at once, the leading and trailing, but without this discipline, an uncontrolled proliferation of images can occur as departments try to come up with their own solutions to the problem of out-of-date clients.

Given that suppliers have been increasing the rate of the product introduction cycle even as buyers have been backing off the upgrade cycle, it is possible that a given company's preferred upgrade cycle is substantially longer than the product introduction cycle. In such cases, it may be prudent to plan to upgrade every other product cycle.

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